CLAIMS:

1. A detection cartridge comprising:

a housing comprising an interior volume;

a sensor operably attached to the housing, the sensor comprising a detection surface;

a detection chamber located within the interior volume of the housing, wherein the detection chamber comprises a volume defined by the detection surface and an opposing surface spaced apart from and facing the detection surface, wherein the opposing surface comprises a flow front control feature; and

a waste chamber located within the interior volume of the housing, the waste chamber in fluid communication with the detection chamber.

2. A cartridge according to claim 1, wherein the detection surface comprises an acousto-mechanical waveguide.

3. A cartridge according to claim 1, wherein the sensor comprises a surface acoustic wave acousto-mechanical sensor.

4. A cartridge according to claim 1, wherein the flow front control feature comprises discrete structures protruding from and separated by a land area on the opposing surface of the detection chamber.

5. A cartridge according to claim 1, wherein the flow front control feature comprises one or more channels in the opposing surface of detection chamber.

6. A cartridge according to claim 5, wherein at least one channel of the one or more channels is oriented generally perpendicular to a longitudinal axis defined within the detection chamber between an input end and an output end of the waste chamber.

7. A cartridge according to claim 1, wherein the flow front control feature comprises one or more regions of hydrophobic material occupying a portion of the

opposing surface and one or more regions of hydrophilic material occupying a portion of the opposing surface.

8. A cartridge according to claim 7, further comprising at least one pair of successive bands of hydrophobic material and hydrophilic material wherein each pair of successive bands extends across a width of the detection chamber.

9. A cartridge according to claim 1, wherein the flow front control feature comprises discrete structures protruding from and separated by a land area on the opposing surface of the detection chamber, one or more regions of hydrophobic material occupying a portion of the opposing surface, and one or more regions of hydrophilic material occupying a portion of the opposing surface.

10. A cartridge according to claim 1, wherein the flow front control feature comprises one or more channels in the opposing surface of detection chamber, one or more regions of hydrophobic material occupying a portion of the opposing surface, and one or more regions of hydrophilic material occupying a portion of the opposing surface.

11. A cartridge according to claim 1, further comprising absorbent material located within the waste chamber.

12. A cartridge according to claim 1, wherein the cartridge further comprises capillary structure located between the detection chamber and the waste chamber.

13. A cartridge according to claim 1, further comprising a vent that, when open, places the interior volume of the housing in fluid communication with ambient atmosphere around the cartridge.

14. A cartridge according to claim 13, wherein the vent is located in the waste chamber.

15. A cartridge according to claim 13, wherein the vent comprises a closure element.

16. A cartridge according to claim 1, further comprising a fluid monitor operably connected to the housing, wherein liquid located within the interior volume of the housing can be sensed by the fluid monitor.

17. A detection cartridge comprising:

a housing comprising an interior volume;

a sensor operably attached to the housing, the sensor comprising surface acoustic wave acousto-mechanical sensor;

a detection chamber located within the interior volume of the housing, wherein the detection chamber comprises a volume defined by the detection surface and an opposing surface spaced apart from and facing the detection surface, wherein the opposing surface comprises one or more channels formed therein;

a waste chamber located within the interior volume of the housing, the waste chamber in fluid communication with the detection chamber;

absorbent material located within the waste chamber; and

capillary structure located between the detection chamber and the waste chamber.

18. A detection cartridge comprising:

a cartridge housing comprising an interior volume;

a sensor operably attached to the cartridge housing, the sensor comprising a detection surface;

a detection chamber located within the interior volume of the cartridge housing, wherein the detection chamber comprises a volume defined by the detection surface and an opposing surface spaced apart from and facing the detection surface, wherein the opposing surface comprises a flow front control feature;

a waste chamber located within the interior volume of the cartridge housing, the waste chamber in fluid communication with the detection chamber;

one or more sealed modules, wherein each module of the one or more sealed modules comprises an exit port attached to the cartridge housing through one or more

module ports that open into the interior volume of the cartridge housing, and wherein each module further comprises:

a module housing comprising an exit port and a sealed interior volume;

an exit seal located over the exit port of the module; and

a plunger located within the interior volume of the module housing, wherein the plunger is movable from a loaded position in which the plunger is distal from the exit port to an unloaded position in which the plunger is proximate the exit port;

wherein movement of the plunger towards the exit port opens the exit seal such that material from the interior volume of the module housing exits through the exit port into the interior volume of the cartridge housing.

19. A cartridge according to claim 18, further comprising a staging chamber within the interior volume of the cartridge housing, wherein the staging chamber is located upstream from the detection chamber, and wherein the module ports open into the staging chamber.

20. A cartridge according to claim 18, wherein the interior volume of at least one module of the one or more sealed modules comprises:

a first chamber comprising a liquid located therein;

a second chamber located within the interior volume of the module housing, the second chamber comprising a reagent located therein; and

an inter-chamber seal isolating the second chamber from the first chamber within the module housing;

wherein the first chamber, the inter-chamber seal, and the second chamber are located between the plunger and the exit seal;

wherein movement of the plunger towards the exit port opens the inter-chamber seal such that the liquid in the first chamber contacts the reagent in the second chamber.

21. A method of moving sample material through the detection cartridge of claim 1, the method comprising:

providing a detection cartridge according to claim 1;

delivering sample material into the interior volume of the housing of the detection cartridge, wherein the sample material flows into the detection chamber, and wherein flow front progression of the sample material through the detection chamber and towards the waste chamber is controlled at least in part by the flow front control feature on the opposing surface within the detection chamber.

22. A method according to claim 21, wherein delivering sample material into the detection chamber comprises delivering the sample material into a staging chamber located within the interior volume of the housing, wherein the sample material flows from the staging chamber into the detection chamber.

23. A method according to claim 21, wherein detection cartridge further comprises absorbent material within the waste chamber, and wherein the absorbent material draws sample material into the waste chamber.

24. A method according to claim 21, further comprising capillary structure located between the detection chamber and the waste chamber, wherein the capillary structure draws sample material from the detection chamber.

25. A method according to claim 21, further comprising a vent that, when open, places the interior volume of the housing in fluid communication with ambient atmosphere around the cartridge, and wherein the method comprises opening the vent to control sample material flow through the detection chamber.

26. A method according to claim 25, wherein opening the vent comprises adjusting the size of the vent to adjust the rate of sample material flow through the detection chamber.

27. A sealed module comprising:

a housing comprising an exit port and a sealed interior volume;

an exit seal located over the exit port;

a first chamber located within the interior volume of the housing, the first chamber comprising a liquid located therein;

a second chamber located within the interior volume of the housing, the second chamber comprising a reagent located therein;

an inter-chamber seal isolating the second chamber from the first chamber within the housing; and

a plunger, wherein the first chamber, the inter-chamber seal, the second chamber, and the exit seal are located between the plunger and the exit port, and wherein the plunger is movable from a loaded position in which the plunger is distal from the exit port to an unloaded position in which the plunger is proximate the exit port;

wherein movement of the plunger towards the exit port opens the inter-chamber seal such that the liquid in the first chamber contacts the reagent in the second chamber, and wherein further movement of the plunger into the unloaded position opens the exit seal such that the liquid and the reagent from the interior volume of the housing exit through the exit port.

28. A module according to claim 27, wherein the plunger comprises a tip, wherein the tip faces the inter-chamber seal and wherein the tip pierces the inter-chamber seal to open the inter-chamber seal.

29. A module according to claim 27, wherein the first chamber and the second chamber comprise hermetically sealed compartments.

30. A module according to claim 27, wherein the plunger defines a portion of a volume of the first chamber when the plunger is in the loaded position.

31. A module according to claim 27, wherein the plunger mates with the exit port when the plunger is in the unloaded position.

32. A module according to claim 27, wherein the liquid in the first chamber comprises a water and the reagent in the second chamber comprises a hydrolyzable material.

33. A method of delivering materials using a sealed module of claim 27, the method comprising:

providing a sealed module according to claim 27;

moving the plunger towards the exit port of the sealed module to open the inter-chamber seal and force the liquid from the first chamber into contact with the reagent in the second chamber; and

moving the plunger towards the exit port to open the exit seal and expel the liquid and the reagent from the interior volume of the housing through the exit port.

34. A method according to claim 33, wherein the plunger comprises a tip that pierces the inter-chamber seal.

35. A module comprising:

a housing comprising an exit port and a sealed interior volume;

an exit seal located over the exit port;

a chamber located within the interior volume of the housing, the chamber comprising one or more reagents located therein;

a plunger movable from a loaded position in which the plunger is distal from the exit port to an unloaded position in which the plunger is proximate the exit port; and

an input port in fluid communication with the chamber, wherein the input port enters the chamber between the plunger and the exit port when the plunger is in the loaded position;

wherein movement of the plunger towards the exit port opens the exit seal such that material from the interior volume of the housing exits through the exit port.

36. A module according to claim 35, further comprising a seal closing the input port.

37. A module according to claim 35, wherein the plunger comprises a tip, wherein the tip faces the exit seal and wherein the tip pierces the exit seal to open the exit seal.

38. A module according to claim 35, wherein the plunger defines a portion of a volume of the chamber when the plunger is in the loaded position.

39. A module according to claim 35, wherein the plunger mates with the exit port when the plunger is in the unloaded position.

40. A method of delivering materials using a module according to claim 35, the method comprising:

providing a module according to claim 35;

delivering sample material comprising a liquid into the chamber through the input port, wherein the sample material contacts the reagent located within the chamber; and

moving the plunger towards the exit port to open the exit seal such that the liquid exits from the chamber through the exit port.